

CLAIMS

What is claimed is:

1. A tubular polymeric composite member comprising:
an innermost layer comprising a first thermoplastic polymeric material;
an outermost layer comprising a second thermoplastic polymeric material the same as or different from the first thermoplastic material; and
5 at least one interlayer between the innermost and the outermost layer comprising a third thermoplastic polymeric material different from the first and the second thermoplastic material and selected from the group consisting of: (i) polyurethanes, polyurethane copolymers, and blends thereof; and (ii) polyesters, copolyesters, and copolymers and blends thereof,
10 wherein each of the innermost and outermost layers is bonded directly to one of the interlayers, and
wherein each of the first and the second thermoplastic polymeric material is selected, independently, from the group consisting of polyamides and copolymers and blends thereof.
2. The composite member of claim 1 wherein each of the first and the second thermoplastic polymeric material is selected, independently, from the group consisting of nylons and copolymers and blends thereof.
3. The composite member of claim 1 wherein each of the first and second thermoplastic material is selected, independently, from the group consisting of nylon 11 and nylon 12, and copolymers and blends thereof.
4. The composite member of claim 2 or 3 wherein the first and the second polymeric material are the same.
5. The composite member of claim 4 wherein the third thermoplastic material comprising each of the interlayers is the same.

6. The composite member of claim 5 wherein the third thermoplastic material comprising each of the interlayers has a durometer of between about 80 Shore A and 75 Shore D.

7. The composite member of claim 1 wherein the third thermoplastic material comprises:

- (a) a polyester or copolyester, or a copolymer or blend thereof; and
- (b) a functionalized thermoplastic adhesive resin.

8. The composite member of claim 7 wherein the third thermoplastic material comprises by weight, based on the total weight of (a) and (b), between about 75-95% of (a) and between about 5-25% of (b).

9. The composite member of claim 7 wherein (b) comprises an anhydride-modified polyethylene.

10. The composite member of claim 7 wherein (a) comprises a copolyester elastomer.

11. The composite member of claim 7 wherein each of the innermost and outermost layers is chemically bonded to said one of the interlayers.

12. The composite member of claim 1 wherein the third thermoplastic material comprises a copolyester elastomer.

13. The composite member of claim 1 wherein:

each interlayer has a thickness, independently, of between about 10-85 mils (0.25-2.15 mm); and

each of the innermost and the outermost layer has a thickness, independently, of
5 between about 5-20 mils (0.13-0.51 mm).

14. The composite member of claim 1 wherein the member comprises a first said interlayer having an outer surface and a inner surface bonded directly to the innermost layer, and a second said interlayer having a outer surface bonded directly to the outermost layer and an inner surface, and wherein the member further comprises a
5 reinforcement layer i nterposed b etween the outer surface of the first interlayer and the inner surface of the second interlayer.

15. The composite member of claim 14 wherein the third thermoplastic material comprising the first and the second interlayer is the same.

16. The composite member of claim 14 wherein the reinforcement layer comprises one or more filaments of one or more fibers.

17. The composite member of claim 16 wherein the reinforcement layer is braided, wound, woven, or knitted of the one or more filaments of the one or more fibers.

18. The c omposite m ember o f c laim 1 6 w herein t he o n e o r m ore f ibers are selected from the group consisting of nylon fibers, polyester fibers, aramid fibers, polyvinyl alcohol fibers, polyvinyl acetate fibers, polyolefin fibers, polyphenylene bezobisoxazole fibers, metal wires, and blends thereof.

19. The composite member of claim 16 wherein the reinforcement layer has interstices between the filaments of the fibers and wherein the first interlayer is bonded to the second interlayer through the interstices.

20. The composite member of claim 1 wherein each of the innermost and outermost layers is chemically bonded to said one of the interlayers.

21. The composite member of claim 1 wherein the member comprises a first said interlayer having an outer surface and a inner surface bonded to the innermost layer, and a second said interlayer having a outer surface bonded to the outermost layer and an inner surface, and wherein the member further comprises:

5 a first interior layer comprising a fourth thermoplastic polymeric material the same as or different from the first and the second thermoplastic polymeric material, the first interior layer having an inner surface bonded to the outer surface of the first interlayer, and an outer surface;

 a second interior layer comprising a fifth thermoplastic material the same as or
10 different from the first and the second polymeric material, and the same as or different from the fourth polymeric material, the second interior layer having an outer surface bonded to the inner surface of the second interlayer and an inner surface; and

 a reinforcement layer interposed between the outer surface of the first interior layer and the inner surface of the second interior layer.

22. The composite member of claim 21 wherein the reinforcement layer comprises one or more filaments of one or more fibers.

23. The composite member of claim 22 wherein the reinforcement layer is braided, wound, woven, or knitted of the one or more filaments of the one or more fibers.

24. The composite member of claim 22 wherein the one or more fibers are selected from the group consisting of nylon fibers, polyester fibers, aramid fibers, polyvinyl alcohol fibers, polyvinyl acetate fibers, polyolefin fibers, polyphenylene bezobisoxazole fibers, metal wires, and blends thereof.

25. The composite member of claim 22 wherein the reinforcement layer has interstices between the filaments of the fibers and wherein the first interior layer is bonded to the second interior layer through the interstices.

26. The composite member of claim 21 wherein each of the first, second, fourth, and fifth thermoplastic polymeric material is selected, independently, from the group consisting of nylons and copolymers and blends thereof.

27. The composite member of claim 26 wherein each of the first, second, fourth, and fifth thermoplastic polymeric material is selected, independently, from the group consisting of nylon 11 and nylon 12, and copolymers and blends thereof.

28. The composite member of claim 21 wherein the third thermoplastic material comprising the first and the second interlayer is the same.

29. The composite member of claims 21, 26, 27, or 28 wherein the first, second, fourth, and fifth thermoplastic polymeric material are the same.

30. The composite member of claim 1 wherein the third thermoplastic material comprises a polyurethane, or a copolymer or blend thereof.

31. The composite member of claim 30 wherein the third thermoplastic material has a durometer of between about 63 Shore D and 83 Shore D.

32. The composite member of claim 30 wherein the third thermoplastic material has a durometer of between about 70 Shore D and 75 Shore D.

33. The composite member of claim 30 wherein the third thermoplastic material comprises a crystallization retarding component.

34. The composite member of claim 33 wherein the crystallization retarding component is a diol which is branched, substituted, or heteroatom-containing.

35. The composite member of claim 30 wherein the third thermoplastic material has a hard segment content of at least about 20%.

36. A tubular polymeric composite member comprising:
a first layer comprising a first thermoplastic selected from the group consisting of polyamides, and copolymers and blends thereof; and
a second layer bonded directly to the first layer comprising a second thermoplastic
5 polymeric selected from the group consisting of polyurethanes, and copolymers and blends thereof, wherein
the second thermoplastic material has a durometer of between about 63 Shore D and 83 Shore D.

37. The composite member of claim 36 wherein the second thermoplastic material has a durometer of between about 70 Shore D and 75 Shore D.

38. The composite member of claim 36 wherein the third thermoplastic material comprises a crystallization retarding component.

39. The composite member of claim 38 wherein the crystallization retarding component is a diol which is branched, substituted, or heteroatom-containing.

40. The composite member of claim 36 wherein the third thermoplastic material has a hard segment content of at least about 20%.

41. A tubular polymeric composite member comprising:
a first layer comprising a first thermoplastic selected from the group consisting of polyamides, and copolymers and blends thereof; and
a reinforcement layer comprising a material selected from the group consisting of:
5 (i) a blend of a second thermoplastic material different from the first material, and a fiber component; and (ii) high tensile strength polymers.

42. The composite member of claim 41 wherein the reinforcement layer comprises a blend of a second thermoplastic material and a fiber component, the fiber

component being selected from the group consisting of glass, carbon, polymeric, ceramic, and metallic fibers, and combinations thereof.

43. The composite member of claim 42 wherein the fiber component has a mean average length of between about 0.01-10 mil (0.25-250 μm).